

ABSTRACT

A suction cannula, dilator, stapler and staple are provided herein. The suction cannula is concentrically aligned with a puncture site (e.g., puncture in an artery or vein) and provides vacuum about the periphery of the puncture site so that the puncture hole is always located during a medical procedure, and to thereby permit a surgeon to quickly and efficiently close the puncture using, for example, a stapling device. In the preferred embodiment the suction cannula has a tube-in-tube construction having an inner tube and an outer tube where a vacuum can be applied between the tubes. The dilator (and suction cannula) centers around a guide wire (that is already in place within the venous structure) and follows the path of the guide wire to the puncture site. Preferably, the dilator has a tapered tip on the distal end that enters a hole made in the vein or artery. A blood indicator is provided on the proximal end to provide visual feedback when the surgeon is in the artery (i.e., pulsating blood indicates that the tip of the dilator is in the artery). Also preferably, the dilator includes a tapered tip on the distal end that is radially collapsible so that the dilator can be withdrawn from the artery and the suction cannula is thereby permitted to advance over the dilator to the artery wall. The stapler is provided which holds a multi-pronged staple on a shaft at the distal end. The stapler is constructed to slide into the suction cannula (i.e., the inner tube of the cannula) to approach the puncture in the artery, to permit the stapling of the artery. Preferably, the distal end of the stapler includes a T-flange that holds a staple and a crimping mechanism that crimps the staple into the artery, thereby sealing the puncture. The T-flange permits the staple to be held and inserted into the artery wall. An oval hub on the T-flange is provided that mates with an oval hole in the center of the staple. To hold a staple, a staple is placed on the hub and rotated 90 degrees, thereby affixing the staple to the stapler. Once the staple is crimped onto the artery wall, the shaft can be rotated 90 degrees,

thereby aligning the oval hub and the oval hole, so that the stapler can be removed. Preferably, the staple includes a plurality of prongs that are inserted into the vascular wall.